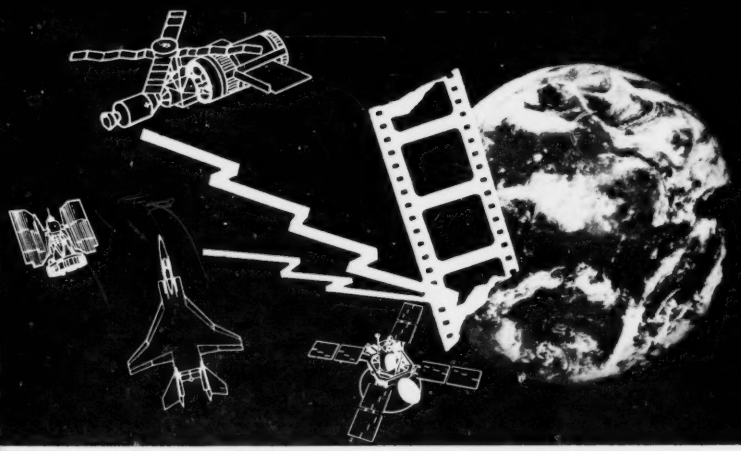

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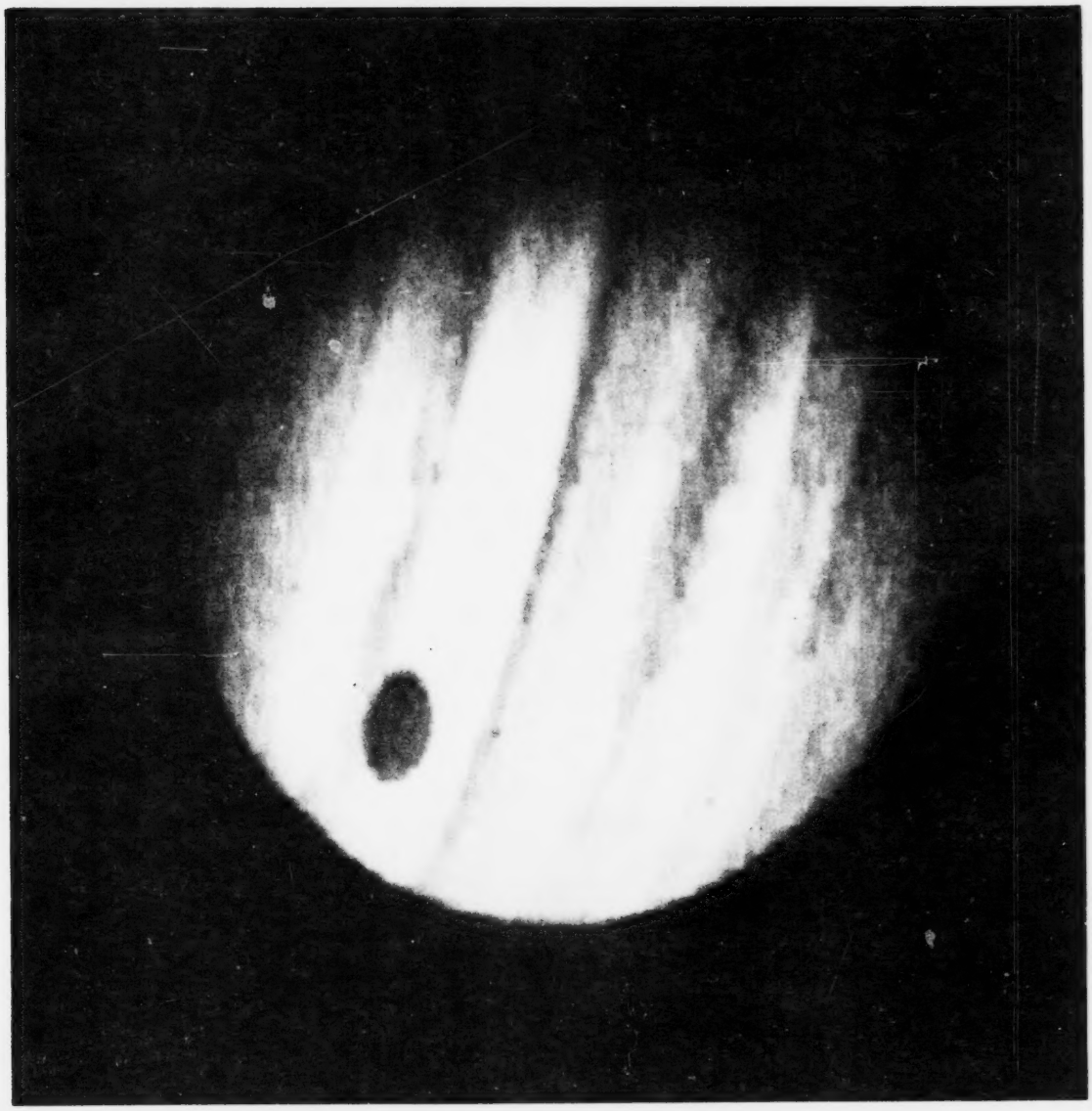

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LETTER FROM WASHINGTON

December 28, 1973

Dear Colleagues:

The year 1973 has been generally good for NASA, and NASA has contributed memorable events to the history of 1973. In several very important ways, 1973 has been NASA's best year.

We can all be proud of the excellent performance of the Skylab astronauts, ground crews, and equipment over so many months. We can all be proud of the first closeup observations of Jupiter and its moons by Pioneer 10, the new information about the energy processes within the Sun and distant stars from Skylab and Copernicus (OAO–3), the wealth of valuable observations of Earth from ERTS–1 and Skylab, the extensive observations made of Comet Kohoutek from Skylab and automated spacecraft, and the promising results from NASA's aeronautical research during 1973, the agency's 15th anniversary year.

Skylab has been of especial significance for all of us at NASA, and for America's future in space. It has taken us a giant step forward from the Apollo era of lunar exploration toward routine use of the Space Shuttle and the manned Spacelab module, for science and for practical benefits, in the 1980s and beyond.

In October, we completed a comprehensive new study of the number and kinds of payloads we could launch with the Shuttle and Spacelab between now and 1991 using budgets no larger than our budget for FY 1973. The results of this study

COVER

Image of Jupiter taken by Pioneer 10 shows the planet's great Red Spot.

were most impressive. The payloads described are tentative, of course, and not approved programs. But they do give a clear and encouraging preview of how much NASA and other government agencies and other countries cooperating with us can accomplish during the coming Shuttle era. This study should also encourage imaginative thinking throughout NASA and the aerospace industry to devise still better and more varied missions for the Shuttle and Spacelab. The name of the study is *1973 Payload Model: Space Opportunities 1973-1991*. I hope everyone interested in NASA's future has a chance to examine it and help strengthen it as this dynamic planning effort continues.

The Shuttle program is progressing well. All but one of the prime contractors for the Shuttle have now been selected. (The integration contractor for the solid rocket booster will not be chosen until 1976.) Most of the subcontractors for the Shuttle Orbiter have also been lined up. According to our present schedule, the fabrication of the first two Orbiters will begin in FY 1975.

Significant progress was also made during 1973 on the manned Spacelab module which, when used with the Space Shuttle, will give us a versatile and productive space station for scientific and applications missions lasting up to 30 days.

Progress on the Spacelab module also brought a major advance in international cooperation. Nine European nations, working through the European Space Research Organization (ESRO), have agreed to fund, design and build the Spacelab module at a cost of more than $300 million. This favorable decision by the Europeans, based on careful independent studies they have made, confirms our judgment that a new era of great promise is in the making in Earth Orbit.

Our perfect launch record in 1972 (the first in NASA's 15-year history) was almost matched in 1973. Thirteen of our 14 launch attempts in 1973 were successful. The record string of successful launches begun in November 1971 extended into June 1973 for a total of 26 straight successes over 19 months. The string of straight successes for NASA's Scout rocket increased by one to 29. The all-time perfect record for the Saturn launch vehicles was extended to 13 for Saturn V and eight for the Saturn IB.

A more detailed account of progress in NASA's aeronautical research and technology utilization programs is given in this issue of NASA ACTIVITIES immediately following this letter. I would also like to note the close cooperation with the Soviet Union which has developed in the Apollo-Soyuz Test Project during 1973; the successful launch of Pioneer 11 to continue the exploration of Jupiter and its moons and perhaps Saturn; the successful launch of Mariner 10 to begin closeup study of Mercury, the innermost planet; the discovery by OAO–3 of convincing evidence of the actual existence of a so-called "Black Hole" in our own Milky Way Galaxy; the excellent performance of the advanced Nimbus weather satellite launched late in 1972; the recent establishment of the Lost Cost Systems Office at NASA Headquarters; and the addition of two large antennas (210-foot diameter) in Australia and Spain to our Deep Space Network in time to receive returns from Pioneer 10.

So 1973 was a good year for NASA in many ways. But Skylab and Pioneer 10 furnished an outstanding climax.

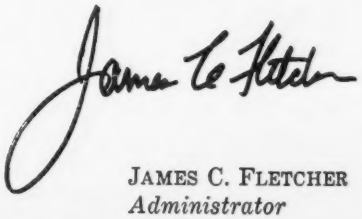
Skylab should be convincing to everyone that the Shuttle era will be highly productive and full of challenge. It has added the vast volume of Near Earth space to the habitable regions of Earth already used by mankind. Now we need the Shuttle to make firm the bonds between this new region in Earth orbit and the old regions of land, sea, and air.

Pioneer 10 has greatly broadened mankind's horizons. It has proved that there are no barriers to our intensified exploration of the Outer Planets and that we have much to learn and marvel at out there.

Back at NASA, the prospects for 1974 are generally good. I will discuss them further after the President's Budget for FY 1975 is announced in January.

I want to congratulate all of you on your successful endeavors in 1973, and to wish you the very best, both professionally and personally, in 1974.

Sincerely,



JAMES C. FLETCHER
Administrator

LOOKING BACK ON 1973

The following excerpts are taken from the Headquarters roundup of the NASA highlights of last year (Release No. 73–281):

AERONAUTICS AND SPACE TECHNOLOGY

NASA aeronautical programs this year continued to attack problems of aircraft noise and pollution, to enhance safety, to improve the efficiency and the operational economics of aeronautical flight, as well as to study and develop technology for future generation aircraft.

A good example of progress this year, in view of current attention to efficient use of energy, is the NASA supercritical wing program.

NASA flight tested the new wing design on an F–8 aircraft, and the results show that, by using this wing, the test aircraft could fly 15 per cent farther without using any additional fuel.

Along these same lines, NASA has been flight testing an aircraft advanced flight control system called digital fly-by-wire. As a result, it appears that aircraft equipped with this advanced control system could improve handling qualities for all flight conditions, enhancing flight safety.

Because of its responsiveness, the fly-by-wire control system can be used to directly reduce aircraft loads and structural weight. Additionally, light-weight wires replace the heavy system of metal rods, hinges and hydraulic lines that previously translated the pilot's signals from the aircraft control stick to the aircraft's control surfaces.

These reductions in aircraft weight result in increases in payload potential and in more miles flown per gallon of fuel expended.

The computer system flight tested in the digital fly-by-wire program was originally used aboard the Apollo 15 spacecraft on its mission to the Moon. NASA is adapting this space technology for use here on Earth.

Substantial progress this year also has been realized in reducing the noise of jet engines, as well as engine pollution emissions. For example, the JT8D engine refan program has progressed to a point where in February, 1974, NASA will start ground testing this jet engine modified with NASA-developed technology. The engine modifications, incorporated on JT8D engine-powered aircraft (727, 737, and WC–9), could reduce by 75-per cent or more the aircraft areas affected by the noise from these aircraft. Since these aircraft comprise more than 60 per cent of the commercial aircraft in use in this country, noise reductions could be quite significant.

In a cooperative Federal Aviation Administration/NASA noise abatement program, the NASA-developed, two-segment landing procedure was tested in regular airline passenger service late this year. Reactions from passengers and pilots to the modified approach and landing techniques were very good. It is anticipated that a 67-per cent reduction in ground area impacted by objectionable aircraft noise will be achieved during landings of 727 aircraft using this procedure.

Another area where NASA aeronautics research and technology programs could have a major impact is the internal combustion engine. NASA general aviation aircraft engine research work is currently using automobile engines to demonstrate the feasibility of an internal combustion concept which appears to significantly reduce pollution emissions while actually increasing engine efficiency—that is, increasing the miles-per-gallon performance of the engine.

In this experimental concept, a small portion of the gasoline is converted to a hydrogen-rich mixture of gases by a hydrogen generator and fed to the engine for combustion with regular gasoline. This hydrogen injection technique allows the engine to run on a much leaner gasoline/air mixture.

NASA started several new flight research programs this year, including the Remotely Piloted Research Vehicle (RPRV) program where the pilot actually flies the aircraft from a cockpit located on the ground.

The advantage of this NASA-developed technique is that there is no risk to the test pilot during the flight maneuvers so that high-risk, more advanced technology can be investigated and high risk maneuvers can be performed very early in the flight test program. Additionally, scale models of aircraft or spacecraft are used instead of more expensive experimental vehicles, and the systems themselves (cockpit, etc.) do not have to be man-rated. Consequently, an RPRV flight test program may cost less than half that of a full-scale manned program.

TECHNOLOGY UTILIZATION

During 1973, more than 2,000 new examples of space-developed innovations and techniques were reported under NASA's comprehensive Technology Program.

This program is the focal point for the transfer of potentially beneficial space technology to the civilian community. Since its inception 11 years ago, more than 30,000 items have been reported. As a result, hundreds of important new products and applications have become part of our everyday life.

To speed the technology transfer process, NASA has liberalized its patent licensing procedures and is granting more exclusive patent licenses. This new policy often includes provisions for payment of royalties once the product is on the market. During the year, NASA granted five exclusive patent licenses, the largest number since the inception of the program.

Making new technology available to potential users involves an extensive nation-wide dissemination program. In addition to publications announcing innovations, seven specialized regional dissemination centers work directly with about 2,000 companies each year. During 1973 more than 57,000 industrial inquiries were handled under the program.

Under a pilot program established late in 1972, a NASA liaison office was opened in New York City to work directly with city agencies on such problem areas as public safety, drug detection and fire protection. The effort has proved highly successful.

Perhaps the single most important innovation introduced through the Technology Utilization Program during the year was the rechargeable heart pacemaker. This unique device, adapting electronic components originally designed for space use, was developed under NASA auspices by the Johns Hopkins University. Once implanted, the device can be recharged by the patient at home using an external power source, thus eliminating the need for surgery every two years to replace currently conventional devices. The device is also smaller and lighter than earlier pacemakers.

Other significant biomedical advances stemming from the program during the year include:

- Development of a radio transmitter temperature pill which passes through a patient's alimentary tract and allows doctors to check localized temperature changes which could reveal presence of infection or other disorders;
- A technician-operated, portable visual testing device—the Automated Visual Sensitivity Tester—to permit early detection of eye disorders;
- Demonstration of a test hospital room for paralyzed patients using space-developed devices such as sight switches, monitors and servomechanisms to permit remote operation of communications systems and appliances for the comfort and recreation of bedridden persons;
- A compact, lightweight emergency medical package called Telecare, containing essential medical equipment needed for on-the-scene emergency treatment.

In other areas, new development announced by NASA during 1973 included development of a tiny burglar alarm based on a NASA invention originally designed to measure blood pressure within the heart; a radar-reflective, self-inflating life raft; a fluoride-metal composite material which is self-lubricating at high temperatures and should have wide industrial application; a new psychomotor testing device called EPIC with wide application for aptitude testing; and development of a technique involving cavitation which can restore obliterated serial numbers on various metals.

JSC REORGANIZES FOR ROLE AFTER SKYLAB PROGRAM ENDS

Two Directorates Are Combined and New One on Data Systems Analysis Created

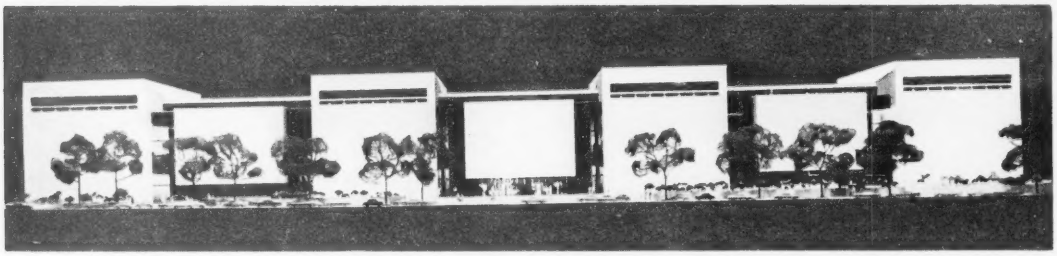
A reorganization plan that will go into full force after the end of the Skylab Program in February has been developed at Johnson Space Center to adjust it to its evolving role in the post-Skylab era of manned space flight.

Dr. Christopher C. Kraft, Jr., Director of the Houston Center, said that the reorganization essentially combines two directorates—Flight Crew Operations and Flight Operations—into a single organization to be known as Flight Operations Directorate and establishes a new directorate, Data System and Analysis.

The attention of the first of these will be de-

PROGRESS ON NEW NATIONAL AIR AND SPACE MUSEUM

The present museum at Smithsonian Institution



An artist's sketch of the projected museum, now under construction at Independence Avenue and 7th Street S.W.

Construction to date. The museum is scheduled to be occupied in the summer of 1975 and opened to the public on July 4 of the Bicentennial Year of 1976, the date on which Viking is expected to soft-land on Mars.

voted entirely to space flight and aircraft activities, while the latter will be responsible for providing institutional and programmatic data systems and related analysis, as well as to manage and provide the onboard software for the Space Shuttle.

"The Space Shuttle Program and the Apollo-Soyuz Test Program are our major manned space flight challenges in the coming years, and the resources of the Center should be properly organized toward these goals," Dr. Kraft said, and added: "At the same time, however, we intend to implement the reorganization in such a fashion that there is no adverse effect on the ongoing Skylab Program."

The Flight Operations Directorate will be headed by Kenneth S. Kleinknecht, present Skylab Program Manager, with Eugene F. Kranz, Chief of the Flight Control Division, as Deputy Director.

Howard W. Tindall, Jr., and Lynwood C. Dunseith have been named Director and Deputy Director, respectively, of the Data Systems and Analysis Directorate. They served in the same capacity in the former Flight Operations Directorate.

BRINGING POWER BY AIR—A flying U.S. Army crane from Fort Eustis, VA is shown as it picked up an emergency generator at Wallops Station and hauled it away to relieve a power crisis on two Chesapeake Bay islands.

NASA HELPS 2 CHESAPEAKE BAY ISLANDS IN POWER EMERGENCY

Flies in Generator from Wallops Station to Supply Electricity During Christmas Season

Christmas might have been a doleful season for residents of two tiny islands in Chesapeake Bay had not NASA's Wallops Station on Wallops Island, VA, come to the rescue.

A large generator on Tangier Island ceased to operate last summer, forcing residents to obtain power from neighboring Smith Island. On Dec. 14, the Smith Island generator broke down. Moreover, the power line connecting the two islands was blown down during a snow storm.

A call for help was received by Wallops Station from the Accomack County (Virginia) Board of Supervisors on Dec. 16. Action was taken immediately. Through Langley Research Center, arrangements were made for a CH-54 flying crane from the Army's 355th Aviation Co. of Fort Eustis to land at Wallops and pick up one of the Station's emergency generators. Thirty minutes later the equipment was deposited on Tangier Island.

About 1,000 persons were affected by the power crisis.

SKYLAB HARDWARE STORED

Skylab backup hardware is being moved to Marshall Space Flight Center to be placed in storage.

Two complete sets of flight hardware were manufactured, the second to be used as a spare in case of emergency need. Since the first cluster achieved orbit as planned and the series of manned missions is nearing successful conclusion, the second set of hardware is now surplus. It is being moved from manufacturing plants into storage areas for later use or disposal.

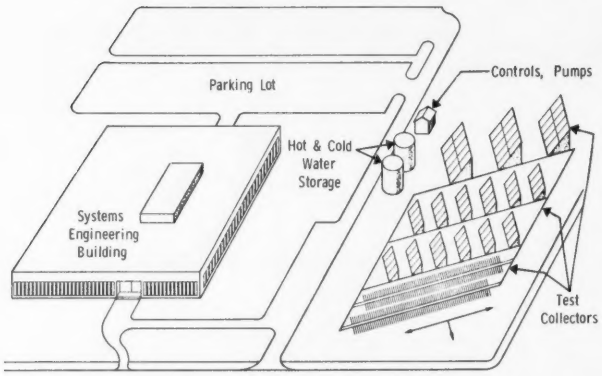
Already delivered to MSFC are the payload shroud, fixed airlock shroud, deployment assembly and solar array system wings for the Orbital Workshop. The backup Workshop will be transported in March from Huntington Beach, CA, to New Orleans and then to MSFC.

The Airlock Module and Multiple Docking Adapter will be moved, joined together, by barge from St. Louis to Huntsville in February. The Apollo Telescope Mount and its SAS wings are already at the Center.

All the items, plus the AM ground support equipment spares, MDA corollary experiments, ATM spares and OWS ground support equipment spares, will be placed in plastic "tents" with controlled environments in two buildings at MSFC. All other backup hardware will be stored under ambient conditions in buildings near the NASA docks.

A three-year, fixed-price incentive contract for complete systems management of the Scout launch vehicle, effective Nov. 1, has been signed by NASA and LTV Aerospace Corp.

SOLAR COLLECTOR TEST BED
LANGLEY RESEARCH CENTER



NASA WILL TEST RAYS OF SUN AS SOURCE OF HEAT ON EARTH

Dr. Fletcher Tells Congress of Experimental System to Be Built at Langley

Use of the Sun as a source of heat on Earth moved a step nearer reality recently when Dr. James C. Fletcher, NASA Administrator, testifying before a House of Representatives energy subcommittee, revealed that Lewis Research Center will develop an experimental solar collector system to capture enough sunlight to heat and cool a one-story office building planned at Langley Research Center.

Expected to be completed in mid-1975, the building would have 53,000 square feet of space.

"As far as we know," Dr. Fletcher said, "this building will be the first of its size in the world for which solar energy will provide a significant part of its heating and cooling load."

Plans call for a 15,000-square-foot collector, a size it is estimated will provide for most of the heating requirements and some of the cooling requirements. It will also test energy storage and provide data on all aspects of the system.

"As these data are analyzed and the state of the art advances, we will be able to expand the collector system to supply all the energy requirements for the building," Dr. Fletcher told the subcommittee.

Water-filled tubes inside solar collectors would absorb the Sun's heat, using it for direct hot water heating and to operate an absorption refrigeration unit for cooling. For convenience in conducting the heat problem, solar units will be located on the ground beside the building.

Lewis Research Center will design the experimental solar system and will select the candidate solar collector designs. It also will evaluate various types of solar collectors, testing them in a solar simulator producing typical sunshine conditions.

The solar simulator will allow standardized testing of collector panels developed under other programs in NASA and by other agencies. Marshall Space Flight Center is performing demonstration tests with a collector promising excellent efficiency, Dr. Fletcher reported. The National Science Foundation plans to develop a number of units. Standardized testing, it was pointed out, will insure objective comparisons.

Solar heating systems like that planned for Langley, it is believed, should also be practical for private residences. Both MSFC and the National Science Foundation are investigating this possibility in considerable detail.

NASA is planning a 1976 launch of a Laser Geodynamic Satellite (LAGEOS). Officials explain that it "will track the Earth relative to the satellite, in contrast to the traditional case of tracking a satellite relative to the Earth."

The LAGEOS is expected to provide important information regarding Earth motions and strain. These movements, within the surface of the Earth, are the fundamental cause of natural disasters such as earthquakes.

WAYS TO REDUCE FUEL CONSUMPTION IN HOUSEHOLD HEATING

The White House and the Bureau of Standards have combined their thoughts in a new effort to encourage household consumers of fuel and energy to play their part in the present national conservation drive. They suggest the following seven steps, reminding that each will improve personal comfort and reduce heating costs:

1. Weatherstrip and caulk around all windows and doors.

When a cold draft is felt coming from a window or door that faces against the wind, it or its framing is leaking. To remedy this, install weather stripping at movable joints and caulk the frames. The cost soon will be realized in the savings of fuel.

2. Install storm windows (or insulating glass).

Storm windows will cut in half the heat loss through the windows of a house. The investment will pay for itself within a decade, including interest costs at six per cent.

3. Install overhead and sidewall insulation.

The equivalent of six inches of good thermal insulation over the top floor ceiling will contribute greatly to comfort in both winter and summer and will pay for itself by reducing winter heating bills and summer air conditioning expense. Even increasing the insulation from three or four inches to six will pay for itself in eight to 12 years and thereafter return an annual dividend of some 12 to 15 per cent on the investment.

4. Maintain an efficient heating plant.

The heating exchange surfaces of a heating plant should be kept clean, and the combustion air adjustment should be checked by service professionals. If the plant has air filters, it is easy for the home occupant to clean or replace them when needed.

5. Close window draperies at night.

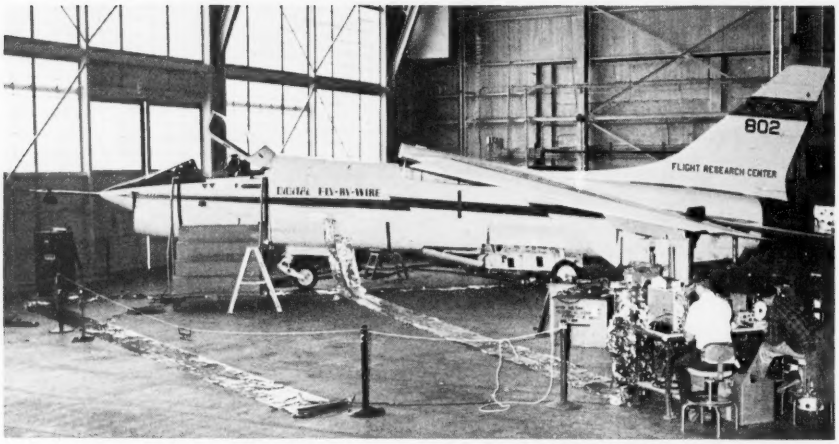
Closed fabric drapery at a window reduces the radiative heat loss and adds to the comfort of people sitting near it.

6. Close and seal against attic air leakage and ventilation.

Due to the warmth and lighter weight of indoor air, as compared to outdoor air in winter, there is a tendency for the air in the living space to flow upward into an attic, causing heat loss and conveying moisture which might condense or deposit as frost which ultimately will melt and cause wetting. Seal around attic stairway doors, pulldown stairways, ceiling fans, electric fixtures, plumbing vents and pipes, and air ducts which pass into the attic.

7. Pay proper attention to utilities.

Turn off all electric lights, TV, radio, and other devices when not needed. Repair leaking water faucets. Lower the thermostat setting for eight hours each night. To reduce it four degrees can cause a saving of $1.80 on a $60-per-month heating bill.



STUDYING THE EFFECT OF LIGHTNING—This was the scene at Flight Research Center recently when simulated lightning strikes were applied to the F–8 Digital Fly-by-Wire aircraft to test the effect on its flight control system. A generator near the nose provided the strikes, which were of considerably lower voltage than real lightning to prevent serious damage to the plane. Cables hooked to the particular electrical system under study ran from the aircraft to measuring instruments along strips of aluminum foil, which grounded the airframe and provided low interference connections. Results are expected to be known by February.

MSFC OPENS SPACELAB OFFICE

A Spacelab Program Office, to manage U.S. functions in the international project, has been established at the Marshall Space Flight Center, in line with the "lead center" role assigned it by the Office of Manned Space Flight.

Thomas J. Lee, who headed MSFC's Sortie Lab Task Team, will be the new Spacelab Program Manager.

In announcing the formation of the new office, Dr. Rocco A. Petrone, MSFC Director, said: "I want to emphasize that some of the best technical and managerial efforts of the Center must be focused on this program, which will provide a versatile vehicle for low-cost space experimentation and form the basis for further international cooperative efforts in space."

Under an agreement signed in September, the European Space Research Organization (ESRO) will design, develop and manufacture the Spacelab, now expected to be ready for delivery in late 1978 and to fly in 1980. Launched by the Space Shuttle, it will consist of a pressurized manned laboratory and unpressurized instrument pallet. It will be carried on Earth orbital flights from seven to 30 days in duration, and will permit scientists to go into orbit and conduct experiments in a variety of disciplines.

During the manufacture, NASA will provide technical support, particularly as the development relates to Space Shuttle interfaces. After Spacelab has been delivered, the agency will manage all operational activities, including crew training and flight operations. It is contemplated that at least one European will be on the flight crew of the first launching.

PETE CONRAD TO RETIRE

Announcement has been made that Astronaut Charles (Pete) Conrad will retire from NASA and the U.S. Navy, effective Feb. 1, 1974, to become vice president and chief operating officer of the American Television and Communications Corp., a cable television firm based in Denver, CO.

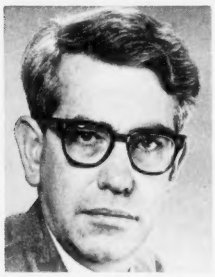
Holding the rank of captain in the Navy, Conrad will retire after more than 20 years of Navy service, 11 of them as an astronaut. He has flown on four space missions: the Gemini 5 and 11 flights, the Apollo 12 flight, and as a member of the first Skylab crew.

He will continue to serve as a member of NASA's Space Systems Committee, a group of experts within and outside the agency charged with planning current and future space projects.

SPECIAL PROJECTS CHIEF

David Williamson, Jr., Assistant Associate Administrator, was appointed Assistant Administrator (Special Projects) on Dec. 4 to report directly to the Associate Administrator.

In making the announcement, Dr. James C. Fletcher, NASA Administrator, said: "This appointment recognizes Mr. Williamson's professional skill and competence in handling important special projects of great significance to NASA."



Williamson joined NASA in 1959 as a management assistant in the Office of Space Flight Programs. In 1961, he was named Chief, Program Coordination, in the Office of Tracking and Data Acquisition. His next assignment was in 1963, when he became Assistant to the Associate (later Deputy) Administrator, Dr. Robert C. Seamans, Jr. From 1967 to 1970, he was Deputy Assistant Administrator for Program Plans and Analysis.

A graduate of Princeton, he entered government service as a management intern in the Department of the Navy, after having served from 1952 to 1955 as an artillery officer in the U.S. Army. During 1957 and 1958, he was a budget analyst in the Bureau of Ordnance.

He was awarded NASA's Exceptional Service Medal in 1972. In 1965, he received the William A. Jump Memorial Foundation Meritorious Award for Exemplary Achievement in Public Administration.

MSFC MANAGES KOHOUTEK CONSOLE

NASA's extensive study of the Comet Kohoutek during the Skylab 4 mission has been further implemented by the addition of a Kohoutek Console within Mission Control at the Johnson Space Center.

The console is managed by the Marshall Space Flight Center under the direction of Bill Snoddy, Skylab's Kohoutek project scientist from MSFC's Space Sciences Laboratory.

"The purpose of the console is to facilitate real-time planning, coordination and execution of the Kohoutek program with principal investigators, ground controllers and the Skylab 4 crew," explained Snoddy. "We're situated in the corollary experiments room so we're able to closely interface Kohoutek's requirements with other experiment requirements and get them passed along to the crew for execution."

Another function of the Kohoutek console is to provide details of scheduled Kohoutek viewing activities to scientific communities around the country, allowing them to coordinate their comet studies with those of Skylab. This is accomplished on a daily basis through the use of recorded status reports.

The console is manned 24 hours a day, seven days a week. Kohoutek operations will continue throughout the current mission.

FISK UNIVERSITY GETS GRANT

A grant of $22,754 has been awarded Fisk University, a predominantly black college in Nashville, TN, by Marshall Space Flight Center to fund a study of the optical effects of contamination of infrared windows by the outgassing of materials in outer space.

Dr. E. Silberman, principal investigator of the study, explained that deposits of particulate matter and gaseous condensates on spacecraft windows, thermal control surfaces and optical elements could seriously affect the results of optical measurements in earth resources studies from satellites or other spacecraft.

"The results of this study," he said, "should make it possible to prevent some of the difficulties or, at least, to compensate their effects by performing necessary corrections to the raw data."

Fisk received the grant under NASA's Developing Institutions Program. This program seeks to involve colleges with predominantly minority enrollments in more research and development efforts which will benefit the schools, aerospace science and technology, and society at large.

KEY AWARDS

The Kitty Hawk Memorial Award, presented annually by the Los Angeles Chamber of Commerce to citizens who have distinguished themselves for outstanding aeronautical achievement and to military men who have distinguished themselves as members of a military team, was awarded the Skylab 2 crew at a banquet in Los Angeles Dec. 7. Captains Charles Conrad and Paul Weitz were present to receive the award. Captain Joseph Kerwin, the third member, was unable to attend. All are of the United States Navy.

The last military men to receive the award, presented in December, 1971, were members of the Apollo 15 crew—Astronauts David R. Scott, James B. Irwin and Alfred M. Worden—all of the U.S. Air Force and all able to be present for the occasion.

TRAINING SEMINAR—Some of those who participated in the recent training seminar, first sponsored by the Space Coast Chapter of Federally Employed Women, took time off to tour Kennedy Space Center. Shown here at KSC, left to right, are Willie Gaither, Equal Opportunity Complaints Officer, NASA; Dehlia Black, Army Missile Command, Huntsville, AL; Barbara Bullock, Crane Naval Ammunition Depot, and Joan Liddy, Space Coast Chapter vice-president, KSC.

MSFC'S DYER AT OIL MEETING

Morris Dyer, Deputy Director of Safety and Manned Flight Awareness at the Marshall Space Flight Center, was a participant in a recent conference of the President's Council on Environmental Quality in Washington, DC.

The conference, on Outer Continental Shelf Technology, was held to review the findings of a study requested by President Nixon for use in establishing administration policy on oil and gas development in the Atlantic and Gulf of Alaska Outer Continental Shelves as a major source of energy for domestic use.

Dyer, the only NASA representative at the conference, has been involved in several recent studies to assess and eliminate hazards in exploration, development and production of off-shore oil and gas deposits.

A team of five MSFC technologists, headed by Dyer, was appointed by the Center Director in 1971, at the request of the Director of the U.S. Geological Survey, to study, assess and report on safety and anti-pollution technology for off-shore oil and gas lease management programs.

The team's report has been published and distributed worldwide and has been used in off-shore techonology studies by several organizations.

LUNAR SAMPLE EXHIBITS

The following is a schedule of lunar sample exhibits from Jan. 15 to Feb. 15:

Florida—St. Petersburg Auto Show, Bayfront Center, St. Petersburg, Jan. 24-26.

Indiana—Lakeland School Science Fair, Maple and Nursery, La Grange, Jan. 22-23.

Kansas—Launch Out in '74, Holton, Jan. 14-18.

Massachusetts—NASA Total Impact Program, Plymouth, Jan. 23-26.

New York—NASA Total Impact Program, Herkimer, Jan. 12-18.

Oklahoma—NASA Aerospace Educational Community Involvement Program, Sheppard Shopping Mall, Oklahoma City, Jan. 7-25.

Texas—Houston Museum of Natural Science/History, Houston, Jan. 15-Feb. 15.

Permanent Displays

Alabama—Alabama Space & Rocket Museum, Marshall Space Flight Center, Huntsville.

Florida—Visitor Information Center, Kennedy Space Center.

Kansas—Eisenhower Library, 200 S. E. 4th Street, Abilene.

New York—United Nations Building, New York City.

Ohio—U.S.A.F. Museum, Wright Patterson Air Force Base.

Texas—Johnson Library, University of Texas, Austin; Visitor Information Center, Johnson Space Center, Houston.

Virginia—Visitor Information Center, Langley Research Center, Hampton.

Washington, DC—National Geographic Museum; Smithsonian Institution, National Air Space Museum, 1000 Jefferson Drive S.W.

RADIO-TELEVISION
(Released Nationally)

January

TELEVISION—A color film release in the *Aeronautics and Space Report* series, "Spaceage Drug Detection."

RADIO—Four weekly *Space Story* programs were released: "Skylab Ground Control," (JSC/Kranz); "Mariner-10 Objectives," (JPL/Dr. Dunne); "NASA Aeronautical Goals," (LaRC/Cortright); "Pioneer-10 Results," (Hqs/Dr. Naugle). One *NASA Special Report*, "1973 Aeronautics and Space Highlights."

February Projection

RADIO—Four weekly *Space Story* programs are to be released: "ERTS Applications," (Hqs/Mathews); "Spacelab," (MSFC/Lee); "Windmill Research," (LeRC/Savino); and "Mariner-10 Status," (JPL/Giberson). One *NASA Special Report*, "Kohoutek Results." One set of ten 60-second announcements, *NASA Space Notes*.

MISSISSIPPI TEST FACILITY

(This is the third and last of a series of articles on the Mississippi Test Facility recently published in DIXIE Roto Magazine, the Sunday feature section of the New Orleans Times-Picayune. It was written by its Assistant Editor, Gil Webre.)

Part 3

"An ancient Chinese proverb states "one picture is worth more than 10,000 words."

Even though the old Oriental who came up with that one never heard of ERTS, EROS, NASA or the Department of the Interior, his sage saying certainly fits the dramatic photographs on these pages, as well as the revelation given New Orleans and Jefferson Parish on our cover this week. (Editor's note: The color illustration was an infrared transparency taken from 65,000 feet.)

"These interior pictures are infrared color photos made by ERTS, NASA's Earth Resources Technology Satellite which is spinning around the world this very moment. (Editor's note: The reference is to pictures of Lake Balkhash in the USSR, the Gulf of Corinth, Tokyo Bay, Holy Land, New York and New Orleans.) Each day ERTS circles the globe 14 times in its nearly polar orbit with its remote sensing devices trained on Earth to uncover nature's secrets and help man understand more about the chunk of matter on which he lives. (Incidentally, ERTS passes 370 miles above New Orleans each 18 days.)

"The satellite is one of NASA's babies. The information it's gathering really belongs to all of us. That's where the Department of the Interior and its EROS (Earth Resources Observation Systems) Program enters the picture.

"Most people don't know, but Congress never chartered NASA to sell data to the general public," observed Gary W. North, chief of the EROS Experiments and Evaluation Office at the Mississippi Test Facility.

"The space data was only available through the drugstore-type vendor or as a loan or a gift from people connected with NASA—and they literally gave away millions of dollars of space photos all over the world.

Getting Data to Public

"The government had to come up with an efficient system capable of getting the vast storehouse of data into the hands of the public. After all, this information, acquisition of which had cost billions, was doing only a fraction of its potential good filed away in God knows how many depositories all over the nation. As the distribution system was set up, it was basically put on a pay-as-you-go basis, with customers, you and I included, paying enough of a fee to cover the cost of reproduction.

"The result was the EROS Program, which was allocated to the wide-ranging U.S. Department of the Interior.

"At the time EROS plans were being finalized, MTF in Bay St. Louis was opened by NASA to other federal agencies. After participating in a study of MTF in 1971, Gary North was sent by Interior's Geological Survey from Washington to the Mississippi facility to see if the EROS Program could make use of facilities there. The situation was favorable, so in November, 1971, EROS' first regional office was opened to MTF.

"Basically, the MTF office is a satellite of the EROS Data Center at Sioux Falls, SD.

"Into this (Sioux Falls) center is moving all of the data that NASA has ever collected, all of the aerial photography that's ever been collected by the Department of the Interior, and every picture that has come from the Earth Resources Technology Satellite," says North.

The national center was set up to give the average Joe access to this wealth of knowledge.

"All you pay for is the cost of reproducing the individual picture," North continued. "For instance, a photograph from the satellite (ERTS) that covers 13,000 square miles, the whole city of New Orleans and Lake Pontchartrain will cost $6 at that scale (about an 8x8-inch print.) A 40x40-inch enlargement costs $45."

Since the system is a new one, branches have not been set up in all parts of the country. At present, not everyone has convenient access to it. But this will change with time.

System Computerized

"The system is run by a computer and we have a completely computerized interrogational system," North said. "Now I have at MTF a direct communicating link to the computer. You could walk in and say, 'I'm interested in satellite or aircraft coverage over my hometown,' no matter where it is in the world.

SATELLITE IMAGERY AT MTF—This ERTS satellite imagery of the Amazon Basin points up errors in a 1948 map of the region. The line at the bottom right is a new highway.

"We could punch in coordinates and get back a printout for you that tells you exactly what exists. There is a lot of data on 16-mm microfilm. We can put this film on automatic search machines and punch out frame numbers and display the image for you.

"You can decide if you want it. If you do, we'll make up your order on a magnetic card typewriter. We'll order the image through the computer from Sioux Falls, and in three or four weeks you'll have at your home the photograph that you want."

North stressed this service is available to John Q. Public.

"This is a user service center we've set up at MTF," he says. "We really kind of opened the door here about the first of January.

"We have special equipment to help people work with remotely sensed data.

"Satellite data, for instance, comes down electronically in the form of black-and-white pictures. We have one machine here which permits you to physically combine these black and whites to produce color.

"The user center features close to $300,000 worth of government-surplus equipment that we've gone out and scrounged from around the country from other government agencies. A lot of our units came from NASA."

Spreading Remote Sensing

North further explains one of the functions of the center is to spread the gospel of remote sensing, and to keep interested parties abreast with the latest developments in the field. This hasn't proved difficult, especially since more and more people are becoming aware of the value of remote sensing.

"As of two months ago at Sioux Falls, we were some 60,000 orders behind, what with people demanding copies of the satellite data," says North. "We just could not keep up with the demand. It's increasing at about 200 per cent a month. Most of it is from industry—industry all over the world."

In conclusion, some observations about infrared photography and remote sensing are in order:

Color infrared gave a boost to remote sensing a decade or so ago because it's better than regular color for haze penetration; it's useful in discriminating between healthy and diseased vegetation and it's useful in portraying sediment conditions in water bodies.

"The more heavily sedimented a body of water, the lighter its color," explains North.

"Remote sensing itself is simply an all-inclusive term for collecting data from any platform, be it a satellite, a high-altitude aircraft, a camera on the ground, or any special sensor that operates in various parts of the electro-magnetic spectrum.

"It's an interdisciplinary science that basically works with the natural-resource disciplines such as geology, hydrology, oceanography, forestry, agriculture and archeology. You can get degrees in remote sensing in many universities around the country now."

Then he sums it all up with this simple statement—"It's nothing more than another way to collect data."

All the data collected is dramatic, as photographs make clear.

ACTIVITY AT MTF—At left, C. Patrick O'Neil, forester with the Experiments and Evaluation Office, explains the use of the satellite and aircraft rapid search browse file; while, at right, Henry T. Svehlak, geologist with the General Electric Co., presents a lecture on remote sensing to members of the Mississippi Research and Development Center and Planning and Development Districts during a special course on applications of remotely sensed data to land-use mapping.

NEW NASA PUBLICATIONS

PROJECT MANAGEMENT IN NASA is a study of "the system and the men" by Richard L. Chapman and colleagues at the National Academy of Public Administration. It is based on 149 personal interviews, a questionnaire, and NASA documents. Both problems and strengths of the system by which programs and projects have been managed are described. Paperbound copies of the 128-page report may be obtained for $1.55 each from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. (SP-324)

KOHOUTEK Folder describes in 10 panels NASA activities to study Comet Kohoutek. It also shows the comet's path through constellations, as well as comet rise and comet set tables. Available free from NASA Headquarters and Centers.

MISSION REPORT, "Man Still Matters," The Story of the First Skylab Mission, an eight-page summary of the launch of the Workshop, its problems, and the repairs that saved the mission. Available free from Headquarters.

IMPROVING OUR ENVIRONMENT, a 10-panel folder that describes NASA's role in solving the nation's environmental problems. Available free from Headquarters and Centers.

HEADQUARTERS PRESS RELEASES

(Issued by the Public Information Division, Code FP, Headquarters, Washington, DC 20546. These releases are available only to members of the news media.)

73-254—AE-C (Atmosphere Explorer Satellite) Press Kit
73-261—LAGEOS Satellite Launch Planned for '76
73-275—Navy Scientist Designed Skylab Camera
73-276—Reading Engineer Named to High NASA Post
73-277—Scientist Dies on NASA Antarctic Mission
73-278—Grumman Selected for Shuttle Training Aircraft
73-279—Jupiter Scientists Sum up Preliminary Pioneer 10 Findings
73-280—NASA Scientist Informs Students of Career Opportunities
73-281—Highlights of 1973
73-282—Langley Building to Be Heated, Cooled by Solar Energy
73-283—Rockwell International Contract Extended at KSC
73-284—Dr. Berry to Head University of Texas Health Center

Data returned by Pioneer 10, now safely past Jupiter, are leading experimenters to conclude that Io, the closest of that planet's large moons, is "peculiar"; that the planet's dark orange-brown belts are "hot"; that the spacecraft may be able to pass through Jupiter's intense radiation belts at certain points close in to the planet, as well as a number of other surprising things.

A thousand gypsy moth eggs in two special vials were launched aboard the third and final Skylab mission as part of a research project sponsored by the U.S. Department of Agriculture in cooperation with NASA.

The object is to find out whether the state of weightlessness might be the key to altering the moth's life cycle. If it does prove to be the factor, the insects may be reared by the millions to control a whole class of pests with similar life cycles.

Researchers long have known that rearing millions of insects and sterilizing and releasing them to mate native insect populations could eventually eliminate the pests.

Kennedy Space Center has put into effect a series of moves designed to reduce energy consumption. Included are the implementation of a single daylight shift from 8 a.m. to 4:30 p.m., effective Jan. 6; increased use of car pools; reduced automobile speed; reduced lighting, heat and air-conditioning levels, and suspension of Sunday drive-through tours of the Spaceport.

A specialized team of NASA and contractor employees at KSC's Spaceport is engaged in the complex task of deactivating one of the three mobile launchers used for Apollo operations. With completion of this work in mid-1974, equipment worth millions of dollars will have been salvaged for future use in Space Shuttle and other programs.

NASA has selected Grumman Aerospace Corp., Bethpage, NY, for negotiation of a contract to modify two Gulfstream II aircraft for use as crew trainers for the Space Shuttle Orbiter Vehicle.

The Saturn 1B/Apollo, which would be used in the event a rescue of the Skylab 4 crew becomes necessary, has successfully completed its Flight Readiness Test and is holding.

The first of two artificial fish reefs to be created in the Banana River by Bethune-Cookman College of Daytona Beach, FL, under a NASA grant, has been set in place. It consists of 50 tires, bundled together in groups, systematically placed on the bottom of the river.

INVENTIONS AND CONTRIBUTIONS BOARD MONETARY AWARDS

(The Inventions and Contributions Board, at its meetings of July 31, August 30 and Sept. 28, 1973, recommended that monetary awards be granted to the NASA employees and the NASA contractor employees identified on the following list for scientific and technical contributions to space and aeronautical activities. The recommendations were approved by the Administrator and the awards have been made.)

Name(s)	*Title of Invention or Contribution*
AMES RESEARCH CENTER	
Robert J. Zeiger John C. Gerdts	Concentric Differential Gearing Arrangement
Robert M. Munoz	Continuous Fourier Transform Method and Apparatus
KENNEDY SPACE CENTER	
Herbert E. C ibb	Collapsible High Gain Antenna
JOHNSON SPACE CENTER	
Charles L. Bailey	Solid State Controller
Lubert J. Leger	Method and Device for Detection of Surface Discontinuities or Defects
Larry P. Ratcliff	Latch Mechanism
Hoyt McBryar	Reconstituted Asbestos Matrix
Louis J. Koczela Donald L. Wilgus	An Adaptive Voting Computer System
JET PROPULSION LABORATORY	
Lance G. Hays	Flow Control Valve
William J. Hurd	Code Regenerative Clean-up Loop Transponder for a Type-Ranging System
Charles G. Miller	Improved Dispensing Targets for Ion Beam Particle Generators
Lien C. Yang Arthur J. Murphy	Optically Actuated Two Position Mechanical Mover
Craig D. Sawyer	Control for Nuclear Thermionic Power Source
Harold E. Marsh, Jr.	Cross-Linker Mixed Chain Polymers
Patrick J. Hand	Temperature Compensated Digital Inertial Sensors
Robert A. Rhein John D. Ingham	New Polymer Systems: Chain Extension by Dianhydrides
Alex Shumka	Space-Charge-Limited Solid-State Triode
Harvey L. Jeane	Priority Interrupt System
Francis P. Mathur	Program for Computer-Aided Reliability Estimation
Robert K. Yasui Paul A. Berman	Improved Solar Cell Grid Patterns
Rudolf A. Schindler	Single Reflector Interference Spectrometer and Drive System Therefor
Vilhelm J. Jahnsen	Extraction Device for Extracting Families of Compounds from Liquid Samples and/or Homogenized Solid Samples Contained in a Liquid
BECKMAN INSTRUMENTS, INC.	
Garle C. Brawner, Jr. Larry S. McDavid John M. Walsh	Specific Wavelength Colorimeter
LOCKHEED ELECTRONICS CO., INC.	
George D. Doland	Method and Apparatus for Decoding Compatible Convolutional Codes

INVENTIONS AND CONTRIBUTIONS BOARD MONETARY AWARDS—Cont.

Name(s)	*Title of Invention or Contribution*
McDONNELL DOUGLAS CORP.	
Walter T. Appleberry	A Device for Measuring Tensible Forces
TEXAS TECH UNIVERSITY	
Robert M. David William M. Portnoy	Insulated ECG Electrodes

PATENTS AND INVENTIONS RESULTING FROM NASA RESEARCH

(The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel for the indicated installation.)

Inventor(s) and Employer	*Title of Invention*	*Patent No.*	*Installation*
Bobby W. Kennedy, NASA/MSFC	Integrated Circuit Package with Lead Structure and Method of Preparing the same	3,778,685	MSFC
Phillip C. Lipoma, Lockheed Electronics Co., Houston TX	Data Storage, Image Tube Type	3,778,786	JSC
Jesse H. Hall, Clarence C. Gettleman, John L. Pollack, Gary C. Gildman and Arthur J. Decker, NASA/LeRC	High Powered Arc Electrodes	3,777,200	LeRC
William L. Ray, NASA/MSFC	Polyurethane Foam Insert for Overexpanded Rocket Engine Nozzle to Prevent Start Transient Sideloads	3,776,466	MSFC
Garland N. Rollins, NASA/LaRC	A System for Calibrating Pressure Transducer	3,777,546	LaRC
Herbert R. Cunningham, McDonnell Douglas Corp., Huntington Beach, CA	Potable Water Dispenser	3,777,942	MSFC
Raymond A. Spier, NASA/MSFC	Vee-Notching Device	3,777,605	MSFC
Richard J. Weber and Leo C. Franciscus, NASA/LeRC	Supersonic-Combustion Rocket	3,777,490	LeRC
Edward J. Lynch and Darwyn T. Gray, NASA/FRC	Three-Axis Adjustable Loading Structure	3,776,028	FRC/ARC
Artie D. Jessup, NASA/LaRC	Lyophilized Spore Dispenser	3,776,432	LaRC
Jack K. Holmes, Carl Christopher and Carl Tegnelia, Caltech/JPL	Digital Second-Order Phase-Locked Loop	3,777,272	NaPO
Johnny L. Haynes, Charles G. Wages and Hamilton H. Haralson, Spaco, Inc., Huntsville, AL	Ultrasonic Scanning System for In-Place Inspection of Brazed Tube Joints	3,777,552	MSFC
Shu W. Gee, NASA/FRC	Terminal Guidance System	3,776,455	FRC/ARC
George W. Lewicki and John E. Guisinger, Caltech, JPL	Laser Beam Intensity Control for Thermo-Magnetic Recording and Magnetic-Optic Playback Systems	3,778,791	NaPO
Wilbur C. Heier, NASA/LaRC	Evacuated Displacement Compression Molding	3,780,151	LaRC
Ronald A. Outlaw, Richard E. Stell and Ronald F. Hoyt, NASA/LaRC	An Insitu Transfer Standard for Ultra-High Vacuum Cage Calibration	3,780,563	LaRC
Ivan H. Shim and John J. Stelben, Image Information, Inc., Danbury Corp.	Recorder/Processor Apparatus	3,781,902	GSFC
Jag J. Singh, NASA/LaRC	Mossbauer Spectrometer Radiation Detector	3,781,562	LaRC
Kenneth A. Kadrmas, NASA/MSFC	Self-Calibrating Multiple Field of View Telescope for Remote Atmospheric Electro-Magnetic Probing and Data Acquisition	3,781,552	MSFC
Arthur L. Newcomb, Jr., and Aubrey G. Price, NASA/LaRC	Attitude Sensor	3,780,966	LaRC

PATENTS AND INVENTIONS RESULTING FROM NASA RESEARCH—Cont.

Inventor(s) and Employer	*Title of Invention*	*Patent No.*	*Installation*
William L. Kuriger, Caltech/JPL	Short Range Laser Obstacle Detector	3,781,111	NaPO
David M. Straight, NASA/LeRC	Gas Turbine Exhaust Nozzle	3,780,827	LeRC
George W. Lewicki and Joseph Maserjian, Caltech/JPL	Use of Thin Film Light Detector	3,781,549	NaPO

1973 LAUNCH SCHEDULE

Name	*Launch date*	*Vehicle*	*Range*	*Mission/Remarks*	
Pioneer G (11)	April 5	Atlas/ Centaur	KSC	Second of two identical spacecraft to fly beyond Mars through asteroid belt to Jupiter. Flight time 2 years.	Launched
IMP–J (Explorer 50)	Oct. 25	Delta	ETR	Study: cislunar radiation environment over significant portion of solar cycle; interplanetary magnetic field and Earth's atmosphere. Develop solarflare prediction capability and determine radiation hazard for manned missions.	Launched
Mariner Venus/ Mercury	Nov. 3	Atlas/ Centaur	KSC	First two-planet flyby to obtain Venus environment and atmosphere data and to conduct exploratory investigation of Mercury's environment, atmosphere, surface and body characteristics. Carries television cameras.	Launched
ITOS–F (NOAA–3)	Nov. 6	Delta	WTR	Operational Meteorology Satellite funded by NOAA.	Launched
SL–4	Nov. 16	Saturn I–B	KSC	Launch 3-man crew in Command Service Module for rendezvous with Skylab for open-ended visit.	Launched
AE–C	Dec. 16	Delta	WTR	To investigate photochemical processes in upper atmosphere with spacecraft capable of changing perigee using onboard propulsion.	Launched

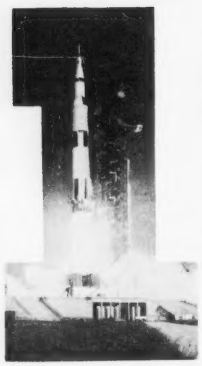
1974 LAUNCH SCHEDULE

Name	*Launch Date*	*Vehicle*	*Range*	*Mission/Remarks*
Skynet II–A (UK)	January 18	Delta	ETR	Reimbursable launch. United Kingdom's communications satellite.
Centaur Proof Flight	January 24	Titan III Centaur	ETR	Test flight of booster planned for Viking Mars launch in 1975.
Intelsat IV F–8	February	A–Centaur	ETR	One of a series of communications satellites to form part of a global communication commercial satellite system. Launch for COMSAT.
San Marcl (SM–C2)	February	Scout	SM	United States/Italy cooperative mission to conduct air density measurements.
UK X–4	February	Scout	WTR	Reimbursable launch. United Kingdom technology satellite with experiments related to spacecraft power systems, attitude control and stabilization.
SMS–A	March	Delta	ETR	First prototype/developmental mission for geostationary meteorological operational satellite system; day and night continuous imaging of cloud cover; sophisticated remote-platform data-collection-and-weather data relay.
WESTAR–A	April	Delta	ETR	Western Union communications satellite. Reimbursable launch.

1974 LAUNCH SCHEDULE—Cont.

ATS–F	April	Titan II C.	ETR	Developmental and demonstrative communications mission using technology applicable to terrestrial and space needs; utilizes 9.15-meter (30-foot) deployable parabolic antenna and communications system with frequencies in several bands; will support public communications experiments in the U.S. and India.
SMS–B	May	Delta	ETR	Second prototype/developmental mission for geostationary meteorological operational satellite system; same as SMS–A; SMS–A and SMS–B will support GARP Atlantic Tropical Experiment (GATE).
Nimbus F	June	Delta	WTR	Meteorological research and development mission to test instruments for expanding atmospheric remote sensing to cloud regions, extend observations to new spectral regions, extend sounding capabilities to higher altitudes, demonstrate feasibility for improvements to operational systems, and support GATE.
WESTAR–B	June	Delta	ETR	Western Union communications satellite. Reimbursable launch.
Skynet II–B (UK)	2nd Qtr.	Delta	ETR	Reimbursable launch. United Kingdom communications satellite.
ITOS–G	July	Delta	WTR	Polar-orbiting operational meteorological satellite funded by NOAA; day and night cloud cover and temperature sounding.
GEOS–C	3rd Qtr.	Delta	WTR	Geodynamic Experimental Ocean Satellite to demonstrate feasibility of satellite-altimeter techniques for measuring the topography of the ocean surface; can be significant contribution to understanding of ocean dynamics.
AEROS–B (German)	July	Scout	WTR	Spin-stabilized, Earth-orbiting satellite designed for upper atmosphere measurements.
Netherlands Sat.–A (ANS–A)	August	Scout	WTR	Designed to obtain data from celestial X-ray and ultraviolet sources.
GOES–A	August	Delta	ETR	First Geostationary Operational Environmental Satellite, follow-on to SMS missions, funded by NOAA.
WESTAR–C	October	Delta	ETR	Western Union communications satellite. Reimbursable launch.
Comsat–A	4th Qtr.	Delta	ETR	First of two maritime communications satellites to be situated over Atlantic and Pacific Oceans.
Hawkeye (formerly Injun)	4th Qtr.	Scout	WTR	To study the topology of the magnetic field at large radial distance over the Earth's dgear caps and the interaction of the solar winds with the geomagnetic field.
Symphonie–A (French/German)	4th Qtr.	Delta	ETR	Experimental communications satellite. Reimbursable.
Helios–A	2nd Qtr.	Titan III Centaur	ETR	To investigate the properties of and processes in interplanetary space in the direction of and close to the Sun by developing, launching and operating automated spacecraft.
Intelsat IV F–6	(Under Study)			One of a series of communications satellites to form part of a global communications commercial satellite system. Launch for COMSAT.
UK–5	(Under Study)			To investigate galactic and extra galactic X-ray sources.
Intelsat IV F–1	(Under Study)			One of a series of communications satellites to form part of a global communication commercial satellite system. Launch for COMSAT.

ARE YOU GETTING YOUR

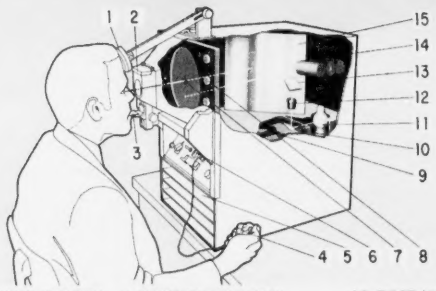


WORTH FROM SPACE?

FOR A PENNY OF YOUR TAX DOLLAR, YOU ARE GETTING ...

A BETTER METHOD OF TESTING EYESIGHT

AMES AUTOMATED VISUAL SENSITIVITY TESTER



1. FOREHEAD SUPPORT
2. VIEWING LENS AND FILTER HOLDER
3. IMPRESSION WAX MOUTHPIECE
4. SUBJECT RESPONSE SWITCH
5. STORAGE FOR 8 FILM CARTRIDGES
6. FIXATION SELECT SWITCH
7. FIXATION CROSS PROJECTED ON SCREEN
8. PHOTO CELLS
9. FILM CARTRIDGE
10. FIRST MIRROR
11. LAMP
12. LENS
13. SECOND MIRROR
14. FIXATION PROJECTORS
15. THIRD MIRROR

Equipment commonly used in testing eyesight can be improved by reducing the amount of operator involvement and by standardizing the test procedures. Such has been the discovery at Ames Research Center, which has come up with an Automated Visual Sensitivity Tester (AVST) that has been refined to the point that it is an accurate, convenient and useful vision screening tool for the general population.

Three vision tests have been completed: (1) to detect glaucoma, the leading cause of blindness; (2) to map the retinal sensitivity zones for the possible presence of abnormal blind spots (called Scotomata); and (3) to detect color blindness. The device has been used to test children as young as five years of age.

AVST uses specially-prepared, closed-loop film cassettes to project programmed moving and stationary visual stimuli on a screen which the observer views through a lens that makes the stimuli appear to be an optical infinity. As a stimulus spot moves over the visual field, the pen of a recorder moves correspondingly to provide a permanent graphic record of the position of the stimulus. A second pen makes a record of when and where the observer sees the stimulus disappear and reappear. A comparison of the two pen plots gives an indication of a particular change in visual function.

In the photograph at left, Dr. Richard F. Haines of ARC, who, with James W. Fitzgerald and Salvador A. Rositano, also of Ames, designed and developed the AVST, prepares the device for testing a patient. At right is a cut-away view of the tester, with basic components labelled.

The device has been patented, and an exclusive license to build and market it has been granted a manufacturer in San Jose, CA.

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

"FOR THE BENEFIT OF ALL MANKIND."